IMAAC

Interagency Modeling and Atmospheric Assessment Center

Real World

Benzene Release at Petrochemical Depot Deer Park, TX

21MAR2019 1800Z

RFI – 19 – 0254aU

21MAR2019

Requestor: NWS – Houston WFO

9963178

Request Summary

- **Request Data**
  - Requestor: Brian Kyle, Lead Forecast Meteorologist, National Weather Service – Houston WFO
  - Contact: 1-800-846-1828, sr-hgx.ops@noaa.gov
  - Request: Downwind hazard for a benzene release in Deer Park, TX as a consequence of the petrochemical fire earlier this week.
- **Solution**
  - Summary: AEGLs at 8 hours
  - Employment: Real World
  - Reachback: S. Runyon, B. Zinn

Deer Park, TX Latitude: 29.732437° N Longitude: 95.091517° W
Time: 1600 CDT Date: 21MAR2019
Hazard: • Benzene vapor released at 125 kg/min
Weather: • High Resolution Numerical Weather Prediction: 12 km NAM from NCEP (CONUS) • Initialized: 18Z 21MAR2019

Modeling Summary

- Known Information: An unknown source at the site of the Deer Park fire is releasing benzene. Current rate and location are unknown. There is no fire currently burning.
- Historical readings indicated benzene concentrations near the tanks close to 350 ppm and near the surrounding retaining wall at 9-30 ppm. Nearby air monitoring sensors in the surrounding area are only measuring less than 0.499 ppm.
- Reachback modeled a continuous release of benzene vapor at a rate of 125 kg/min. This produced results that seemed roughly consistent with the historical readings near the tank farm.

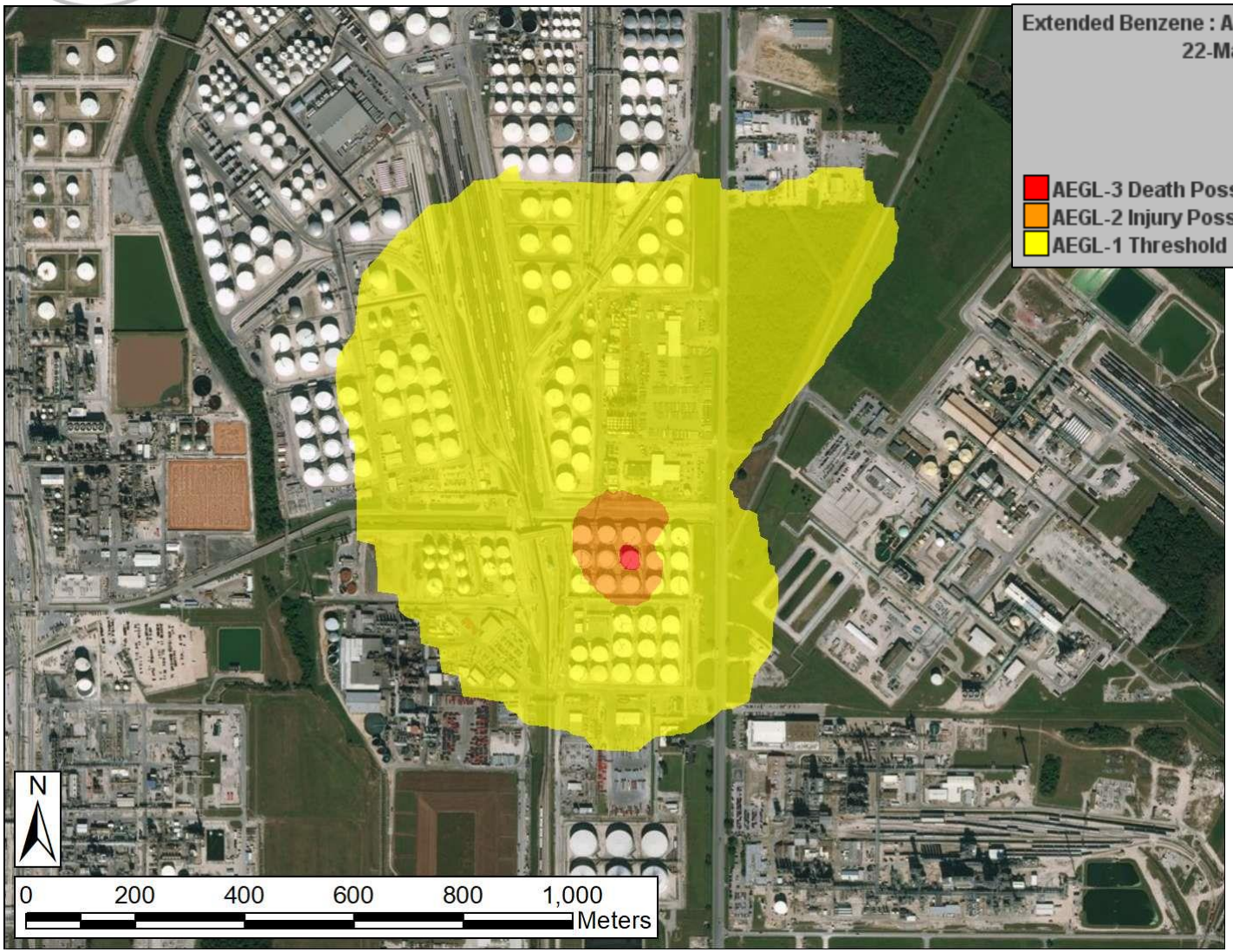
Modeling Caveats

- The rate of benzene release should have some degree of time variance as local temperatures change, but this was not accounted for in the model.

- There may be some thermal lofting of the benzene occurring, but that could not be determined definitively.

- Matching data to model plume calculations is inherently difficult due to the meander and intermittency of real world plume transport and dispersion. These small-scale effects produce a randomness that can be captured in the model but not predicted a priori. **This small-scale variability can cause sensors in very close proximity to produce wildly different results**.

AEGL Effects; 1600 – 2400 CDT 21-MAR



Extended Benzene : Acute Exposure Guideline Levels (INTERIM)
22-Mar-19 05:00:00Z (8.000 hr)

Mean Area

	Value	In contour population
AEGL-3 Death Possible	3.0	3
AEGL-2 Injury Possible	2.0	48
AEGL-1 Threshold	1.0	929

FACTS

Deer Park, TX

Location: 29.732437° N / 95.091517° W

Event Time: 1600 CDT, 21MAR2019

Type: Benzene

Amount: 125 kg/min

Weather: 12 km NAM

Model: HPAC 6.5

Static Population Estimates:
LandScan 2017

Acute Exposure Guideline Levels (AEGL)

Value	Description
AEGL-3	**Death Possible -** the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.
AEGL-2	**Injury Possible -** the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
AEGL-1 (May not be displayed or defined)	**Threshold -** the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGLs represent threshold exposure limits for the general public and are applicable to emergency exposure periods ranging from 10 minutes to 8 hours. It is believed that the recommended exposure levels are applicable to the general population including infants and children, and other individuals who may be susceptible.

FINAL AEGLs – may be used on a permanent basis by all federal, state and local agencies, and private organizations.
INTERIM AEGLs – represents the best efforts of the AEGL Committee to establish exposure limits, and the values are available for use as deemed appropriate on an interim basis by federal and state regulatory agencies and the private sector.

Notes: Casualty numerical figures are based upon a population database (LandScan). LandScan is based on the 2010 census for the U.S. (other nations vary), overhead imagery, geo-economic, and other observable data and was updated in 2017. The population numbers next to associated hazard levels are the people contained within the entire contour based **upon average day and night** time LandScan 2017 data. **Also available are the average day or night** time LandScan 2016 data (US only). For planning purposes, estimates are assumed to be accurate within +10/-5%. Validation testing indicates agreement within 20% for select examined areas. The population data will not predict major shifts in personnel such as relocations (i.e.: religious pilgrimages, refuges, evacuations), events (i.e.: inaugurations, Olympics), or other population shifts. In such cases the population database needs to be updated to reflect actual conditions.